

Ceramic Matrix Composite Combustion Chamber for HAN-Based Monopropellants, Phase I

Completed Technology Project (2009 - 2009)



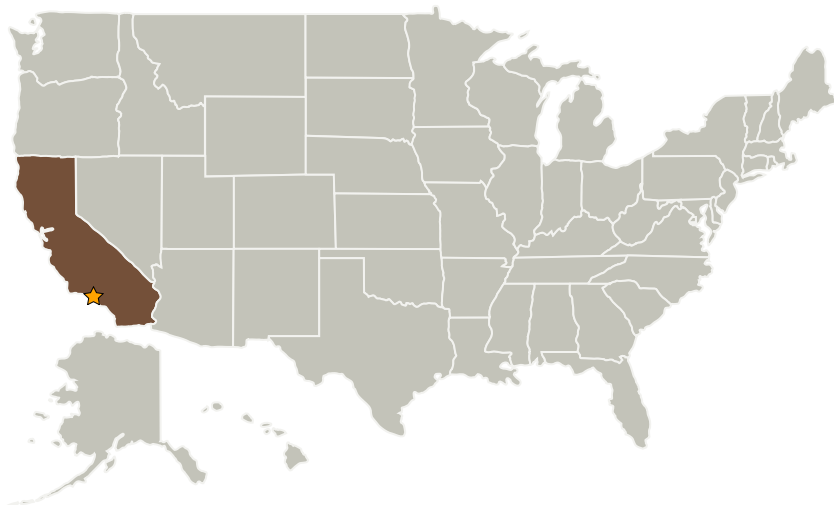
Project Introduction

Ultramet will design and fabricate a lightweight, high temperature 5-lbf combustion chamber. The system will be designed for use with the AF-315 family of monopropellants, which have specific impulse values well in excess of 240 sec, and the combustion chamber material will be based on Ultramet's proven [Zr,Si]C ceramic matrix composite (CMC) technology. This material system allows the zirconium carbide to silicon carbide ratio in the matrix to be adjusted, thus enabling the material to be optimized for different combustion environments. To date, hot-fire testing has been done on Ultramet CMC chambers with both O₂/H₂ and AF-315e propellants. Ultramet will work closely with a leading supplier of spacecraft propulsion systems that will provide the chamber design and perform the hot-fire testing. The fabrication process and the survivability of the material system will be demonstrated in Phase I. Phase II would include long-duration life testing of the Phase I chamber as well as the design, fabrication, and testing of a chamber in the 100- to 500-lbf thrust class suitable for a payload ascent vehicle.

Anticipated Benefits

Potential NASA Commercial Applications: Commercial applications include apogee topping motors for commercial satellites as well as pitch and roll control motors for launch vehicles. Military applications include both primary propulsion and divert and attitude control system functions for missiles.

Primary U.S. Work Locations and Key Partners



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| Organizations Performing Work | Role | Type | Location |
|-----------------------------------|-------------------------|-------------|----------------------|
| ★ Jet Propulsion Laboratory (JPL) | Lead Organization | NASA Center | Pasadena, California |
| Ultramet | Supporting Organization | Industry | Pacoima, California |

Primary U.S. Work Locations

California

Project Transitions

▶ **January 2009:** Project Start

✓ **July 2009:** Closed out

Closeout Summary: Ceramic Matrix Composite Combustion Chamber for HAN-Based Monopropellants, Phase I Project Image

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

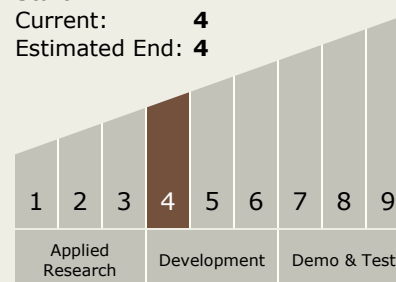
Arthur J Fortini

Technology Maturity (TRL)

Start: 4

Current: 4

Estimated End: 4



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Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.1 Chemical Space Propulsion
 - └ TX01.1.3 Cryogenic